applied hydrostatic pressure for cavities and thoria and hafnium carbide particles in a tungsten matrix and for helium bubbles in a copper matrix. It is seen that the induced stresses in the tungsten matrix, even at 25 kilobars, are substantially less than $G/30$, the stress theoretically required to create dislocations in a perfect crystal (Cottrell 1964 a). However, for copper containing helium bubbles the value of the maximum shear stress developed at the matrix–cavity interface at 25 kilobars exceeds the stress for dislocation nucleation.

§ 3. Materials and Experimental Procedures

The details of the formation of internal voids in powder metallurgy (PM) tungsten have been published elsewhere (Das and Radcliffe 1968 a). In the present case, voids were developed in PM doped tungsten wire (0·030 in. in diameter) by annealing in vacuum at 2200°c for 30 min. The voids, which formed in stringers parallel to the axis of the wire, were generally spherical in shape and ranged in size from a few hundred up to 1000 Å. A tungsten–thoria alloy containing 0·9 vol. % ThO_2 was obtained in the form of rod (0·125 in. diameter) in the as-worked condition. Transverse sections (0·02 in. thick) were cut from the rod by spark-discharge machining. These disc specimens were annealed in vacuum at 2200°c for 30 min in order to develop isolated, rounded thoria particles free from dislocations. A tungsten–hafnium carbide alloy containing 1·4 vol. % HfC was obtained in the form of 0·025 in. thick sheet prepared from electron-beam melted material and solution treated and cooled so as to precipitate the carbide as fine particles. For the model system (i.e. copper containing helium bubbles), high purity polycrystalline copper (99·999% Cu) in the form of annealed sheet (0·025 in. thick), prepared by rolling a zone-refined single crystal, was irradiated with 43 Mev alpha-particles in the cyclotron at Argonne National Laboratory to a total dose of $1{\cdot}4 \times 10^{17}$ particles cm^{-2}. On subsequent annealing at 750°c for one hour, helium bubbles were precipitated. These particular annealing conditions were selected to develop large bubbles, on the basis of previous studies of helium precipitation in copper (Barnes, Redding and Cottrell 1958, Barnes and Mazey 1960, Ghosh, Beevers and Barnes 1960). Pressurizing up to 25 kilobars at room temperature was carried out on specimens of these various systems in a modified piston-cylinder apparatus of the Bridgman–Birch type. An equi-volume mixture of n-pentane and isopentane was used as the pressure fluid and the pressure was measured from the change in electrical resistance of a manganin wire gauge within the pressure chamber. For higher pressures, a stainless steel capsule filled with the fluid was used in a MIA–1 (hybrid, belt or conical type) apparatus (Tanner and Radcliffe 1962).

Thin foils for electron microscopy were prepared by a combination of high precision microjet dimpling and final bath polishing (Das and Radcliffe 1968 b) from the wire samples of tungsten, the rod and sheet